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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/593,716	06/14/2000	Rebecca J. Jackman	H0498/7103 TJO	8402

7590 02/25/2004  
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EXAMINER

CHANG, SUNRAY

ART UNIT PAPER NUMBER

2128

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/593,716

Applicant(s)

JACKMAN ET AL.

Examiner

Sunray Chang

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

### A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☒ Claim(s) 8-11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 June 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4</u> . | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

1. Claims 1 – 33 are presented for examination.
2. Claims 1 – 33 are rejected.

### *Drawings*

3. This application has been filed with informal drawings, which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. The range term "less than about" in claim 8 – 11 is vague and indefinite. Because the range term "less than about" is not well defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

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6. Claims 1 – 18 and 20 – 28 are rejected under 35 U.S.C. 102(a) as being anticipated by Rebecca J. Jackman, Scott T. Brittain, Allan Adams, Mara G. Prentiss, George M. Whitesides (Design and Fabrication of Topologically Complex, Three-Dimensional Microstructures, [www.sciencemag.org](http://www.sciencemag.org), SCIENCE, VOL. 280, 26 JUNE 1998 and referred to as Jackman\_A hereinafter).

7. Regarding independent claim 1, Jackman\_A teaches deforming (uniaxial strain, Page 2089, Col 1, Line 61) a first microstructure (hinges, Page 2089, Col 2, Line 22) at a predetermined deformable portion (thinner wires at joints, Page 2089, Col 2, Line 22).

8. Regarding dependent claim 2, Jackman\_A teaches bending (bending, Page 2090, Col 1, Line 7).

9. Regarding dependent claim 3, Jackman\_A teaches the deformable portion (hinges, Page 2089, Col 3, Line 3) allows deformation (pull, Page 2089, Fig 1E, Fig 1F) in a predetermined direction (axially, Page 2089, Fig 1E).

10. Regarding dependent claim 4, Jackman\_A teaches the deformable portion (hinges, Page 2089, Col 3, Line 3) allows deformation (pull, Page 2089, Fig 1E, Fig 1F) to a predetermined angle (axially, Page 2089, Fig 1E).

11. Regarding dependent claim 5, Jackman\_A teaches thinner dimensions (thinner wires, Page 2089, Col 2, Line 22) than regions immediately adjacent the deformable portion (rigid section, Page 2089, Col 2, Line 23).

12. Regarding dependent claim 6, Jackman\_A teaches the first microstructure (hinges, Page 2089, Col 3, Line 3) is two-dimensional (2D structure, Page 2089, Col 3, Line 1).

13. Regarding dependent claim 7, Jackman\_A teaches the first microstructure (hinges, Page 2089, Col 3, Line 3) is three-dimensional (three dimensions, Page 2089, Col 3, Line 7).

14. Regarding dependent claim 8, Jackman\_A teaches the three-dimensional microstructure (cube, Page 2091, Col 2, Line 8) has at least one component (corner of the cube, Page 2091, Col 2, Line 9) with at least one dimension (section of wire, Page 2091, Col 2, Line 8) less than about 1 mm (~25 $\mu$ m, Page 2091, Col 2, Line 10).

15. Regarding dependent claim 9, Jackman\_A teaches the three-dimensional microstructure (cube, Page 2091, Col 2, Line 8) has at least one dimension (section of wire, Page 2091, Col 2, Line 8) less than about 500  $\mu$ m (~25 $\mu$ m, Page 2091, Col 2, Line 10).

16. Regarding dependent claim 10, Jackman\_A teaches the three-dimensional microstructure (cube, Page 2091, Col 2, Line 8) has at least one dimension (section of wire, Page 2091, Col 2, Line 8) less than about 100  $\mu$ m (~25 $\mu$ m, Page 2091, Col 2, Line 10).

17. Regarding dependent claim 11, Jackman\_A teaches the three-dimensional microstructure (cube, Page 2091, Col 2, Line 8) has at least one dimension (section of wire, Page 2091, Col 2, Line 8) less than about 25  $\mu$ m (~25 $\mu$ m, Page 2091, Col 2, Line 10).

18. Regarding dependent claim 12, Jackman\_A teaches rigid portions (rigid section, Page 2089, Col. 2, Line 23) unaffected (rigid, Page 2089, Col. 2, Line 23) by the deforming step (bend, Page 2089, Col. 3, Line 3).
19. Regarding dependent claim 13, Jackman\_A teaches the deformable portion (hinges, Page 2089, Col 2, Line 22) has a thinner dimension (thinner wires, Page 2089, Col 2, Line 22) than an adjacent portion (rigid section, Page 2089, Col 2, Line 23).
20. Regarding dependent claim 14, Jackman\_A teaches the discontinuous pattern (2089, Fig. 1C, "A" "B").
21. Regarding dependent claim 15, Jackman\_A teaches reinforcing (electroplating, Page 2089, Col 3, Line 68) the three-dimensional microstructure (structure, Page 2089, Col 3, Line 68) after deforming (expanded, Page 2089, Col 3, Line 67).
22. Regarding dependent claim 16, Jackman\_A teaches reinforcing is electroplating (electroplating, Page 2089, Col 3, Line 68).
23. Regarding dependent claim 17, Jackman\_A teaches electroplating (electroplating, Page 2089, Col 3, Line 61) increases a thickness (thin ~50  $\mu\text{m}$ , Page 2090, Fig. 4) of at least a portion of the three-dimensional microstructure (free-jointed nickel chain, Page 2090, Fig. 4) by at least 10% (~500  $\mu\text{m}$ , Page 2090, Fig 3D, 50  $\mu\text{m}$  /500  $\mu\text{m}$  = 10%).

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24. Regarding dependent claim 18, Jackman\_A teaches connecting (joints, Page 2089, Col. 2, Line 23) the first microstructure (hinges, Page 2089, Col 2, Line 22) to a second microstructure (rigid section, Page 2089, Col. 2, Line 23), wherein the first microstructure (hinges, Page 2089, Col 2, Line 22) is integral (electroplating, Page 2089, Col 3, Line 68) with the second microstructure (rigid section, Page 2089, Col. 2, Line 23) in the 3-dimensional microstructure (hexagonal mesh, Page 2089, Col. 2, Line 23).

25. Regarding independent claim 20, Jackman\_A teaches deforming (uniaxial strain, Page 2089, Col 1, Line 61) a microstructure (hinges, Page 2089, Col 2, Line 22) at a predetermined deformable portion (thinner wires at joints, Page 2089, Col 2, Line 22) to provide a deformed portion (cube, Page 2089, Col 2, Line 45); treating (electroplating, Page 2089, Col 3, Line 66) the deformed portion (cube, Page 2089, Col 3, Line 65) to form (reinforce, Page 2089, Col 2, Line 67) a non-deformable portion (rigid, Page 2089, Col 2, Line 67).

26. Regarding dependent claim 21, Jackman\_A teaches electroplating (electroplating, Page 2089, Col 3, Line 66) the deformed portion (final cube, Page 2089, Col 3, Line 65).

27. Regarding independent claim 22, Jackman\_A teaches providing a microstructure (Page 2089, Fig. 1B); deforming (pull, Page 2089, Fig. 1E, 1F) a portion of the microstructure (Page 2089, Fig. 1D, 1E) in a first predetermined orientation (pull, Page 2089, Fig. 1E 1F) to form a deformed portion (2mm, Page 2089, Fig. 1F), treating (electroplating, Page 2089, Col 3, Line 66) the deformed portion (Final cube, Page 2089, Col 3, Line 65); and applying a deformation (pull, Page 2089, Fig. 1E, 1F) to a portion of the microstructure (Page 2089, Fig. 1D, 1E) in a second predetermined orientation (pull, Page 2089, Fig. 1E, 1F).

28. Regarding dependent claim 23, Jackman\_A teaches a predetermined direction (pull axially, Page 2089, Fig. 1E, 1F).

29. Regarding dependent claim 24, Jackman\_A teaches a predetermined angle (pull axially, Page 2089, Fig. 1E, 1F).

30. Regarding independent claim 25, Jackman\_A teaches providing a first and a second three-dimensional substrate (Page 2090, Fig. 3B); printing a pattern on the first and second substrates (Page 2090, Fig. 3C, 3D); supporting the first substrate adjacent the second substrate to provide a combined pattern having at least one feature resembling a link (Page 2090, Fig. 3E).

31. Regarding dependent claim 26, Jackman\_A teaches the link comprises a chain link (Page 2090, Fig. 3F, Fig. 4).

32. Regarding dependent claim 27, Jackman\_A teaches reinforcing (strengthens, Page 2091, Col 1, Line 7) the supported first and second substrates (thin metal patterns, Page 2091, Col 1, Line 7).

33. Regarding dependent claim 28, Jackman\_A teaches dissolving (etching, Page 2091, Col 1, Line 8) the first and second substrates (thin metal patterns, Page 2091, Col 1, Line 7).

34. Claims 29 and 30 are rejected under 35 U.S.C. 102(a) as being anticipated by Rebecca J. Jackman, Scott T. Brittain, and George M. Whitesides (Fabrication of Three-Dimensional Microstructures by Electrochemically Welding Structures Formed by Microcontact Printing on Planar

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and Curved Substrates, JOURNAL OF MICROELECTROMECHANICAL SYSTEMS, VOL. 7, NO. 2, JUNE 1998 and referred to as Jackman\_B hereinafter).

35. Regarding independent claim 29, Jackman\_B teaches A free-standing (Free standing, Page 263, Fig. 3), integral three-dimensional truss (3-D microstructures e.g. tetrahedra, Page 261, Col 1, Line 8).

36. Regarding dependent claim 30, Jackman\_B teaches the truss is a microstructure (3-D microstructures e.g. tetrahedra, Page 261, Col 1, Line 8).

**Claim Rejections - 35 USC § 103**

37. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

38. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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39. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jackman\_A, and in view of Jackman\_B.

40. Regarding dependent claim 19, Jackman\_A teaches first structure (hinges, Page 2089, Col. 2, Line 22) and second structure (rigid sections, Page 2089, Col. 2, Line 23) linked (joints, Page 2089, Col. 2, Line 23) together.

Jackman\_A does not teach electroplating the positioned first and second microstructures.

Jackman\_B teaches positioning a portion (along the edge, Page 263, Col 1, Line 32) of the first microstructure adjacent (along, Page 263, Col 1, Line 32) a portion of the second microstructure and electroplating (electroplating nickel, Page 263, Col 1, Line 33) the positioned first and second microstructures (2-D components, Page 263, Col 1, Line 31).

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Jackman\_A and Jackman\_B to include "positioning a portion of the first microstructure adjacent a portion of the second microstructure and electroplating the positioned first and second microstructures." with the motivation to provide for getting entire structure assembled.

41. Claims 31 - 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackman\_B, and in view of Jackman\_C.

42. Regarding Claim 31, Jackman\_B teaches A free-standing (Free standing, Page 263, Fig. 3), integral three-dimensional truss (3-D microstructures e.g. tetrahedra, Page 261, Col 1, Line 8).

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Jackman\_B does not teach at least one dimension less than about 1 mm.

Jackman\_C teaches at least one dimension less than about 1 mm (1mm, Page 830, Col 2, Line 17).

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Jackman\_B and Jackman\_C to include "at least one dimension less than about 1 mm" with the motivation to provide for A free-standing, integral three-dimensional truss has at least one dimension less than about 1 mm.

43. Regarding Claim 32, Jackman\_B teaches A free-standing (Free standing, Page 263, Fig. 3), integral three-dimensional truss (3-D microstructures e.g. tetrahedra, Page 261, Col 1, Line 8).

Jackman\_B does not teach at least two tetrahedra placed side-by-side.

Jackman\_C teaches at least two tetrahedra placed side-by-side (Page 831, Fig. 3A).

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Jackman\_B and Jackman\_C to include "at least two tetrahedra placed side-by-side" with the motivation to provide for the truss is at least two tetrahedra placed side-by-side. The further electroplating increased the structural integrity of the 3D microstructure.

44. Regarding Claim 33, Jackman\_B teaches A free-standing (Free standing, Page 263, Fig. 3), integral three-dimensional truss (3-D microstructures e.g. tetrahedra, Page 261, Col 1, Line 8).

Jackman\_B does not teach at least two tetrahedra placed side-by-side.

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Jackman\_C teaches at least two tetrahedra placed side-by-side (Page 831, Fig. 3B).

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Jackman\_B and Jackman\_C to include "at least two tetrahedra placed side-by-side" with the motivation to provide for the truss is at least two tetrahedra placed side-by-side. The further electroplating increased the structural integrity of the 3D microstructure.

### **Conclusion**

45. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kasahara et al. (U.S. Patent No. 5,231,303) discloses bending, structure, microstructure, portion, lead. Younan, Xia et al. (Angew. Chem. Int. Ed. 1998. 37) discloses SAM, pattern, PDMS,  $\mu$ CP.

46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sunray Chang whose telephone number is 703-305-8744. The examiner can normally be reached on M-F 7:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703-305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-746-3506.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-6833.

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Sunray Chang  
Patent Examiner  
Group Art Unit 2128  
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February 21, 2004

  
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